

Canterbury Dairy Farmer's Opinions about using Computerised Farm Information Systems

Jorge Alvarez and Peter Nuthall

Research Report 05/2001
July 2001

Farm and Horticultural Management Group
Applied Management and Computing Division
Lincoln University

ISSN 1174-8796

Farm and Horticultural Management Group

The Farm and Horticultural Management Group comprises staff of the Applied Management and Computing Division at Lincoln University whose research and teaching interests are in applied and theoretical management and systems analysis in primary production.

The group teaches subjects leading to agricultural/horticultural commerce and science degrees, though the courses offered also contribute to other degrees.

The group is strongly involved in postgraduate teaching leading to honours, masters and PhD degrees. Research interests are in systems modelling, analysis and simulation, decision theory, agribusiness and industry analysis, business strategies, employment relations and labour management, financial management, information and decision systems, rural development and also risk perceptions and management.

Research Reports

Every paper appearing in this series has undergone editorial review within the group. The editorial panel is selected by an editor who is appointed by the Chair of the Applied Management and Computing Division Research Committee.

The views expressed in this paper are not necessarily the same as those held by members of the editorial panel, nor of the Group, Division or University. The accuracy of the information presented in this paper is the sole responsibility of the authors.

Copyright

Copyright remains with the authors. Unless otherwise stated permission to copy for research or teaching purposes is granted on the condition that the authors and the series are given due acknowledgement. Reproduction in any form for purposes other than research or teaching is forbidden unless prior written permission has been obtained from the authors.

Correspondence

This paper represents work to date and may not necessarily form the basis for the authors' final conclusions relating to this topic. It is likely, however, that the paper will appear in some form in a journal or in conference proceedings in the future. The authors would be pleased to receive correspondence in connection with any of the issues raised in this paper. Please contact the authors either by email or by writing to the address below.

Any correspondence concerning the series should be sent to:

The Editor
Farm and Horticultural Management Group
Applied Management and Computing Division
PO Box 84
Lincoln University
Canterbury
NEW ZEALAND

Email: postgrad@lincoln.ac.nz

Abstract

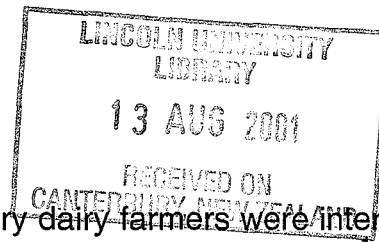
Canterbury dairy farmers' opinions about computerised systems used for managing farm information were collected through 39 stratified, randomly selected interviews. Farmers who are using software note they can save time, the software supports their farm management work, and it also enables them to use management approaches requiring more detailed information. Farmers who are not using computerised systems, but are considering this possibility, explain they are facing other priorities relative to improving their information systems. They are aware of the computer and software advantages, and they have a positive feeling towards computing technology. Some of them, however, feel insecure about their ability to use computers. Farmers not considering computerised systems believe computer technology is useless for their particular situations. Some farmers think computerised systems are unable to solve their actual farm problems, others feel themselves too old to learn the new technology. The interviews have confirmed "earlier" findings from a former mail survey. Key factors associated with the adoption of computer technology are farmer age, directly and through its relationship with farmer education; farmer education itself; the size of the herd; and consultant use intensity and involvement in farm management decision making.

Contents

1 INTRODUCTION	4
2 THE INTERVIEWED FARMERS	4
3 THE INTERVIEW PROCEDURE.....	6
4 RESULTS.....	7
4.1 RESPONSES FROM FARMERS WHO HAVE BEEN USING COMPUTERISED INFORMATION SYSTEMS FOR MORE THAN A YEAR	8
4.1.1 <i>Computerised financial information system users.....</i>	<i>8</i>
4.1.2 <i>Computerised livestock information system users</i>	<i>9</i>
4.1.3 <i>Computerised pasture and feed information system users</i>	<i>9</i>
4.2 FARMERS WHO STARTED USING COMPUTERISED INFORMATION SYSTEMS IN 2000	10
4.3 FARMERS WHO HAVE NOT USED COMPUTERISED INFORMATION SYSTEMS	10
4.3.1 <i>Farmers considering the use of computerised information systems</i>	<i>10</i>
4.3.2 <i>Farmers who are not considering the use of computerised information systems.....</i>	<i>11</i>
5 DISCUSSION	11
5.1 Age	13
5.2 Education.....	13
5.3 Herd size.....	13
5.4 Consulting.....	14
5.5 <i>Explanations that complement the previous quantitative analysis</i>	<i>14</i>
6 CONCLUSION.....	15
7 REFERENCES	16

Tables

Table 2 Comparison between interviewed and non interviewed farmers	5
Table 2.2 Percentage of farmers using each information system type in the main information areas	6
Table 4.1 Types of information systems used by computerised farmers	8
Table 5 Characteristics of the computerised information systems users and non- users	12



1 Introduction

Between July and August of 2000, 39 Canterbury dairy farmers were interviewed to collect part of the data needed to assess some research hypotheses¹ related to farmer adoption, and the usefulness, of computerised information systems. Previously, these farmers had answered a mail questionnaire giving information about their farm information management. The results from this mail survey are reported in Alvarez and Nuthall (2001a) and Alvarez and Nuthall (2001b).

The aim of this report is to present farmers' opinions and explanations that support their decisions for using, or not, computerised systems (software) as key components to their farm information system.

2 The interviewed farmers

The mail survey was answered by 300 farmers, resulting in 290 usable responses. From these, 191 farmers agreed to be interviewed. This group was divided into two subgroups according to on-farm use of computerised systems. The 39 interviewed farmers were selected randomly from both subgroups, to ensure maintaining the ratio between users and non users of computerised systems to that in the 290 responses.

On average, the interviewed farmers have smaller farms (effective area) and herds, they involve accountants more in their decision making and a larger percentage of them own computers, relative to the non-interviewed farmers. Table 2 compares statistics from both groups.

¹Research project: A study of factors affecting the adoption and usefulness of information system innovations: the case of Canterbury and Uruguayan dairy farmers

Table 2 Comparison between interviewed and non interviewed farmers

Farmer characteristic	Interviewed farmers	Non interviewed farmers	Statistical significance
Years dairy farming in Canterbury	15.44	13.02	+
Years dairy farming in total	18.77	18.93	
Age (years)	42.97	43.37	
Herd size (head)	417	487	t-test: 1.812, p=7.3%
Education*	3.23	3.11	
Effective area (hectares)	142	171	t-test: 2.324, p=2.2%
Adviser involvement**	1.26	1.08	
Accountant involvement**	1.08	.88	Mann-Whitney test:-1.739, p=8.2%
Management work % ***	23.82	25.79	
Office work (hours/week)	9.99	10.53	
Computer uptake %	85	70	t-test: 1.922, p=6.0%
Computerised information system use %	62	61	

Notes: * Education was measured using a scale 1=primary or less, 2= secondary equal or less than 4 years, 3= secondary more than 4 years, 4= tertiary equal or less than 2 years, and 5= tertiary more than 2 years. ** These were measured using a scale 0=none, 1=a little, 2=quite a lot and 3=heavily involvement. *** Percentage of manager time devoted to actual management, data collection, analysis, and decision making. + a blank cell means a statistically significant difference was not found.

With respect to information management, interviewed farmers manage their information using more computerised systems and less informal ones than the total surveyed farmers. However, when the main information areas are considered, only in the livestock information area do interviewed farmers show a statistically significant difference in the percentage of different types of systems used (see table 2.2).

Table 2.2 Percentage of farmers using each information system type in the main information areas

	Feed and pasture information area		Finance information area		Livestock information area	
	Interviewed farmers	All farmers	Interviewed farmers	All farmers	Interviewed farmers	All farmers
Informal systems*	23.1	25.8	7.7	11.0	0	1.4
Manual systems**	46.2	43.5	15.4	15.2	28.2	40.7
Computerised systems***	20.5	16.9	59	54.5	38.4	35.2
Service systems****	10.3	13.8	17.9	19.3	33.3	22.8
Chi-square-test	2.11, p<50%		1.47, p<70%		10.4, p<5%	

Notes: * Information management that relies mainly on farmer memory to record. Alternatively, informal writing might be used such as notes on calendars, and they may use off-farm printed reports as backup information. ** Information management approach that is based on formal procedures, such as cash books, field books or calving and mating notebooks. Each of these books allows keeping manual records on specific pieces of information. *** Procedures that enters data using computer systems and keeps electronic files. **** Approach bases on information service providers.

3 The interview procedure

The interviews were performed on the farms and took, on average, 1 1/2 hours. Two guidelines were developed, one for farmers who are users of computerised systems, and another for the rest.

Once the research objectives were introduced, farmers were asked to list 3 to 5 areas that they control most closely as they regard them as very important to the success of the business. Within respect to each of these areas, farmers were asked to state how frequently they updated information, how they processed this information, and how they recognised they were facing a problem and how it is dealt with. This part of the interview was designed to assess farmer information management skills.

Farmers who were using computerised information systems were asked to evaluate the overall usefulness of each software package used, using a simple scale from 1, unsuccessful, to 5, highly successful.

Each software package was then selected (when the farmer used more than one) to talk about the advantages and disadvantages of its use. This started by asking the farmer which were the usual information management functions that

were carried out with the selected software. The farmer was also invited to make a comparison with the pre-computer procedures used to record and analyse the data. At this stage, s/he was asked to summarise the advantages of using the computerised system relative to the original methods.

Some respondents identified economic benefits as a direct reason for adopting computerised systems. If this was not the case, the farmer was invited to make a cost-benefit analysis of her/his decision to use the software.

Finally the interviewees were asked to rank the software using two scales. One related to how well the software meshed with the work environment and the second related to how well the software matched with the farmer's decision making system.

Farmers who were not using computerised information systems were asked to explain their decision for non-use. Some stated that they are going to use a computer soon, others not. The first group was asked to explain their reasons for supporting the proposed change.

The data was collected using forms, a notebook and a recorder. There were technical problems in recording 3 interviews. Total reliance on the notes was necessary in these cases.

4 Results

Of the 39 farmers interviewed, 19 have been using computerised systems for one or more years, 6 started in 2000, and 14 were not users when the interview took place. Within this last group, one farmer was using a consulting service that included information management. Although the farmer was not using a computer himself, his information management was very similar to those using computerised systems. The 13 remaining farmers were split in two categories; those who were thinking of using computerised systems, and those who are not. Each group had 7 and 6 farmers respectively.

Thus 4 groups of farmers were used to answer the following questions:

Why have they changed to a computerised system?

Why are they changing to a computerised system?

Why have they not changed to a computerised system but are thinking of doing so?

Why are they not intending to change?

4.1 Responses from farmers who have been using computerised information systems for more than a year

The 19 farmers of this group were all using a computerised system for managing their financial information. From these, 14 were also using software in the livestock area. Half of these, 7, were also managing their pasture and feed information through computers.

Table 4.1 Types of information systems used by computerised farmers

Finance	Livestock	Pasture and feed	Number of farmers
Computerised	Computerised	Computerised	7
Computerised	Computerised	Not computerised	7
Computerised	Not computerised	Computerised	1
Computerised	Not computerised	Not computerised	4

In 11 interviews the software selected to talk about was the one used to manage financial information, in 6 it was for livestock information and in 3 it was for pasture and feed software (one farmer talked about two packages). Interviewed farmers were using one specific commercial package in the financial and livestock areas. In contrast, farmers were using a wide range of products in the pasture and feed area.

4.1.1 Computerised financial information system users

These farmers gave two main explanations for changing their former financial system. Three farmers had to move from a package as it was Y2K incompatible. The other farmers stated that they choose to change from a former manual procedure. This second group gave two main reasons for changing. Firstly, they wanted to reduce their accountancy fees, mainly by doing the GST returns themselves. The use of financial software also allowed cutting costs by presenting to their accountants pre-processed farm income and expenditure data. The second reason was saving time. Clearly, for those farmers who formerly did their GST returns manually, changing to a computerised procedure means a huge saving in time. However, other farmers explained that computerised procedures have allowed them to perform farm management techniques which were known, but considered too time consuming when these were tried manually. One farmer stated *"instead of doing a budget once at the beginning of the season I can now budget whenever I like, and by using financial software I put the "actuals" in, and can get an updated version and see where I'm going"*. Another farmer stated similarly *"a big advantage of the financial software is that you can update it (the farm budget). As you go through the year you can plug in what you have actually done and then you can forecast ahead, based on the expenditure you expect to make and you can alter the expenditure out further*

once you get to a certain point. That is really good – you can never do that manually. It just takes too long to do it. That has been one really good improvement”.

These farm management techniques involve developing farm and partial budgets, comparing actual cash figures with budgeted ones, and performing “what if” enterprise and costs analyses. In relation to enterprise analysis, one farmer stated “ *I like,..., getting individual reports out on enterprises – I do keep some parts of the farm operation, I run it as an enterprise so it is just for my own information really as I keep some costs separate and then I can very quickly see how much it is costing me to run all of my young stock on the farm”.*

Farmers using computerised financial systems stated that they are performing more analyses and obtaining better control than before. This improvement in their management work provided more decision making confidence and a feeling of having increased their managerial capabilities. One farmer stated “ *I feel more confident about making decisions because I have more in-depth analysis”.* Another added “*at the moment it is now starting to save us time and giving us better information and more financial control”.*

4.1.2 Computerised livestock information system users

Like the former group, these farmers stated two reasons for changing their previous systems. Some farmers were using DOS software, which became obsolete when Windows became the dominant computer operative system. They needed to update. The majority of farmers have complemented their former service system using the software as a new interface between the farmer and the service. The software replaced former paper forms that used to be sent and received by mail – now it is achieved through electronic records and mail. Farmers stated that this change involves three main advantages. Firstly, time saving through electronic transfer. Secondly, faster discovery of discrepancies which increases the information quality control. One farmer explained “*You can pickup discrepancies faster too. You enter it in and the machine says “no such cow” rather than you sending off the information and they ring up and tell you there is no such cow. Oh yes, it’s a hundred times better than doing it any other way”.* Finally, a huge gain in flexibility and accessibility is provided by the farmer control of retrieving and reporting. One farmer said “*you can pick out individual groups of animals, you can go in and do your 2-year olds, 3-years olds, whatever, see what is happening, look at calving dates”.*

4.1.3 Computerised pasture and feed information system users

The three interviewed farmers were using three different kinds of software, one for whole farm planning, another for measuring pasture availability (pasture

probe) and the third for feed budgeting. Two farmers have replaced former manual feed budgeting procedures and the other started his dairy business with the computerised pasture measurement system.

Farmers who have changed their former manual systems stated that the new one has increased their planning, analysing and control capabilities. One of them gave the following explanation: *"we're using it to try and coordinate all the different aspects of the farm. Especially when there's quite a bit of supplement involved, and in our farm there is - maize silage, grass silage, hay, straw, grazing off-farm, some grain being fed as well, and the fluctuation in the pasture. So we try and coordinate all those things into an economic plan. It's all brought back to dollars"*.

4.2 Farmers who started using computerised information systems in 2000

This group involved 6 farmers. One was recorded as a non-user in the mail questionnaire, but subsequently he purchased a computer and software. These farmers have changed mainly from manual procedures. The majority of changes have been made in the financial area (5 from 6). Another 3 farmers have changed their livestock systems.

The explanations given by these farmers did not differ significantly from those given by farmers with more experience as computer users. However, the reasons were formulated in a more general way. One farmer explained that *"it is an information technology age, so we have to keep on"*. Another farmer said *"we could make our life a lot easier by having things down on the computer"*.

4.3 Farmers who have not used computerised information systems

One of these farmers was using a consultancy service that included data recording, processing and information analysis similar, or more sophisticated, than those used by farmers with computerised systems. The remaining 13 farmers were split in two groups according to their willingness to use computerised systems in the future. Each subgroup is presented separately.

4.3.1 Farmers considering the use of computerised information systems

This group has 7 farmers, with currently 6 owning computers for non-business use. They have positive feelings about computer technology and they provided different reasons for not having yet adopted computerised information systems. Almost all explanations are related to lack of time, and secondly to lack of training opportunities. The lack of time comes from a variety of reasons including

a lack of staff in one case, to having an off-farm job in another. One farmer who recently converted from cropping to dairying, stated that his main focus has been developing the dairy farm. Another farmer, who did not see himself as a computer user, suggested that when his wife has more time (she was raising her baby), she would become the computer operator.

Within this group two farmers expressed their lack of confidence and fear of becoming computer users. They believed that the lack of time argument is a simple excuse for being scared of the computing technology. These farmers stated they are facing conflicting information about software and/or do not have enough information available.

4.3.2 Farmers who are not considering the use of computerised information systems

This group has 6 farmers, 4 of them owning computers. These farmers provided five groups of responses to support their decision of not adopting computerised systems. The first explanation refers to personal preferences. One farmer stated *"my strength is not in computers, ..., I feel my strength is more on the farm looking after the stock and the pasture"*. Other farmers said *"I have never really had anything to do with computers"*; *"I am happier out on the farm than at the computer"*. This first reason is complemented with a second one related to lack of computing knowledge and keyboard skills. When farmers were asked if they had tried to learn about computers, one farmer stated *"I have not the inclination to go and get it"*. A third reason provided was the farmer's lack of confidence in computer technology. Complementing this idea, one farmer added, *"computers seem to be obsolete so quickly"*. Farmers also argued that they did not think that using computers was either going to add value to their management work, nor going to tackle the actual farm problems. Finally, farmers stated that they feel satisfied with their current (non-computerised) information systems.

5 Discussion

The results from the interviews have helped confirm findings presented in the other papers (Alvarez and Nuthall, 2001a and Alvarez and Nuthall, 2001b), but also have provided new clues to understand farmer behaviour related to computerised system use.

Simple-variable statistical analysis (Alvarez and Nuthall, 2001a), and multi-variable statistical analysis (Alvarez and Nuthall, 2001b) have identified farmers' characteristics associated with the adoption of computerised systems using the data collected through a previous mail survey. Four main variables were identified: farmer age; education level, herd size, and farm adviser involvement in

decision making. As would be expected, interview results confirm these relationships.

Table 5 Characteristics of the computerised information systems users and non-users

	Age (years)	Education level*	Herd size (head)	Frequency of farm consultant visits (per year)
Non users (not thinking of using)	48.5	3.00	313	0.5
Non users (thinking of using)	42.8	3.25	333	5.1a
New users	41.2	3.00	413	5.5b
All experienced users	41.9	3.79	472cb	5.1c
Experienced users who use only financial systems	44.5	4.00	303	5.5
Experienced users who use livestock systems	41.4	3.79	505	4.2
Experienced users who use pasture and feed systems	40.1	4.00	526	6.0

Notes: * see table 2.1. Herd size: "c" means a statistically significant difference between first group and the fourth, $t=-1.748$, $p=9.4\%$; "b" means a statistically significant difference between second group and the fourth, $t=2.251$, $p=3.7\%$. Consultant: "a" means a statistically significant difference between first group and the second, $t=-3.378$, $p=1.0\%$; "b" means a statistically significant difference between first group and the third, $t=-2.936$, $p=2.6\%$; "c" means a statistically significant difference between first group and the fourth, $t=-4.544$, $p<0.1\%$.

Table 5 presents average values for age, education and herd size for the different groups of interviewed farmers. Farm consultant involvement was measured differently during the interviews than in the mail survey.

Farmers who neither used computerised systems nor were thinking of using them are older, manage smaller herds, and use farm consultants much less than farmers who were not currently using computerised systems but were thinking about it. However, only the last difference is statistically significant.

Farmers who have been using computerised information systems for one year or more are more educated compared to those who have just started during 2000 and to those who have not yet started. However, these differences are not statistically significant.

While quantitative analyse of interviewed farmers does not statistically support the relationships found in the mail survey, due to the small number of cases, interview answers provide a good source of evidence to support these relationships.

5.1 Age

One of the farmers that expressed an unwillingness to use a computerised system stated *"I haven't the knowledge of how to use it. I know that I could get it - that it's available - but I have to have the inclination to go and get it, which I haven't got. Because of my age I guess. It doesn't intrigue me enough to go and do it"*. Some farmers, like this, might see their age as a barrier for adopting software as part of their information systems. On the other hand, age is correlated with education, the younger the farmer, the more educated (Alvarez and Nuthall, 2001a).

5.2 Education

Early adopters are more educated than other groups. Some of these farmers, as they were describing software use advantages, stated that computers made them able to use farm management tools, such as budgeting, comparisons between actual and budget, "what if" questions, and enterprise and cost analyses. They knew of the tools, but they did not use them because there were too time consuming. Through the use of computerised systems, these farmers started to use their knowledge as the computer technology made it feasible (in the farmer's time dimension) to use these tools in a real farm situation.

One farmer explained *"the reason we initially started using it because we felt we needed that knowledge and now, as I said, it's given us a really good history that we really know when we are getting to the edge and when we need to shut up paddocks and how we're going to be able to do for silage and things like that"*. Another farmer stated *"I think our business skills have improved, knowing where we are in comparison to budget at any time, and being able to foresee problems that might come up. This has made us better business people"*.

In analysing this relationship it seems that computer technology and user education shows some kind of synergism. While education may promote a positive approach through the use of computerised systems, computerised systems empowered educated users so they could apply their knowledge, such as using farm management tools. One reinforces the other.

5.3 Herd size

Large herd farmers have a strong incentive for using computerised systems, specially for managing livestock information.

One of these farmers stated *"I couldn't imagine farming without it (the software) now. I couldn't imagine all the screeds of paper, with 950 cows, all laying out there and trying to find who you are looking for"*.

5.4 Consulting

Farm consultants have been promoting technological change in information management as well as in other areas. Both the mail and interview surveys show strong evidence for this relationship. Farmers who neither used computerised systems, nor were thinking of using them employed much less consultant time than other groups. These differences are statistically significant. Like with education, in analysing this relationship it also seems to be a synergism between farmer use of computerised systems and consultancy. Farm consultants promote more informed decision making which may have oriented farmers to search for better information management systems. The use of computerised systems increases the amount of information managed and the data processing capacity. This may lead to identifying new management problems and new problem solving approaches, which might require more technical support. Again, one reinforces the other.

One farmer explained "we needed that tool (software) to give us guidelines. I mean we use consultants as well - they'll go round and say, "well you've left too much cover here", or "you've cut it down too fine here". When we are milking I also record on the computer where the cows are and which paddock they are in so that when the consultant comes he can see which paddocks have been grazed and when. He can say "yes, you've done that one right" or "no, they need to get back in and they just haven't chewed it out enough". There are still clumps and things. That's basically it - it sort of works in conjunction with those two (consultant and software)".

5.5 Explanations that complement the previous quantitative analysis

Through the interviews, farmers provided explanations for adopting computerised systems. The most frequent one was money saving by reducing the accountancy fees, due mainly to the farmer performing the GST returns. Some farmers used to do it manually, others through accountants. Some farmers gave very concrete statements showing that their decision to use financial software was supported by a cost-benefit analysis.

One farmer stated "The software cost around \$900-950, and we saved about \$700 – what it was costing us with our accountant, the computer cash book. That's quite tangible." Another farmer added "I probably would have recovered my expenses within eight months by doing it myself, so that's not too bad".

Other sources of reducing the accountancy fees comes from using the financial software for data pre-processing.

Following the same logic, other farmers stated that through the use of livestock database software, they were able to quickly identify problem cows when they

were receiving veterinary services. In other words, the veterinary visit becomes more efficient and less costly. One farmer said *"I know that if I put those cows into the software I'll be right. I mean obviously the information that goes into the system has to be accurate to make it work. But whenever the vet comes out and I have a sick cow I need to have all the information about that cow - for the last years everything that has happened to it is right there"*. Another added *"if the vet is coming the next morning at 9.00 am, you can actually print the list out tonight and it is an up-to-date list of the cows that have not been mated"*.

A second explanation given by some farmers related to banks. By using financial software, farmers found it easier to follow the banker's requirements, such as presenting budgets and doing sensitivity analyses when they requested loans. One farmer stated *"we would be able to do complete budgets on other options to present to the bank manager - it looks good and is easy to set up"*. Another added *"if we had a problem with the bank or we were applying for another loan with the bank, it was very easy to do a cash flow for them so they could see straight away where you were"*. A third farmer complemented *"if the bank manager turns up I can, with the press of a switch, get a budget update and within seconds I can change figures around to present different scenarios according to circumstances"*.

6 Conclusion

From the 39 interviewed farmers 64% use computerised systems. One quarter of these farmers, who are using computerised systems, started their use in the current year. Of the remaining farmers (36%), 57% stated that they are considering using a computerised system in the future. The rest, 15% of the total, are not. The software adoption process in Canterbury dairy farmers seems to be almost completed.

Farmers who are using software note they can save time, its use supports their farm management work, and its also enables them to use management approaches requiring more detailed information.

Farmers who are not using computerised systems but are considering this possibility, explain they are facing other priorities relative to improving their information systems. They are aware of the computer and software advantages, and they have a positive feeling to computing technology. Some of them, however, feel insecure about their ability to use computers.

Farmers not considering computerised systems believe computer technology is useless for their particular situations. Some farmers think computerised systems are unable to solve their actual farm problems, others feel themselves too old to learn the new technology.

These last two groups of farmers may need strong support and better information about the possibilities, if they are to change their minds.

The interviews have confirmed findings from an earlier mail survey. Key factors associated with the adoption of computers are farmer age, directly and through its relationship with farmer education; farmer education itself; the size of the herd; and consultant use intensity and involvement in farm management decision making.

Older, small herd, and less educated farmers, with little consultant contact, should be targeted for special assistance. This may be based on some concrete and profitable farm uses of computerised systems, such as producing the GST returns and those related to farm accounting, vet and bank services.

7 References

Alvarez, J. and Nuthall, P. (2001a) Computer use and attitudes for a sample of Canterbury, New Zealand, dairy farmers, Farm and Horticultural Management Group, Lincoln University, Canterbury.

Alvarez, J. and Nuthall, P. (2001b) Computers and Information Management in Canterbury Dairy Farming, Farm and Horticultural Management Group, Lincoln University, Canterbury.